PRIVATE.

FOR CIRCULATION AMONG THE MEMBERS OF THE INSTITUTE.

ANNUAL GENERAL MEETING

OF THE

British Institute of Preventive Medicine,

(With which is amalgamated the COLLEGE OF STATE MEDICINE),

JUNE 27th, 1895.

REPORT OF THE COUNCIL.

The Council have the honour to report that in accordance with the Special Resolution passed at an Extraordinary General Meeting, held on June 11th, 1894, and confirmed at an Extraordinary General Meeting on June 29th, 1894, the number of the Members of the Council has been increased from 24 to 27, and the following new Members have been elected :—

25.	THE DUKE OF WESTMINSTER	Representing Members of the Institute.
26.	MR. CHARLES WILLIAM HARRISON	Representing the Worshipful Company of Grocers.
27.	MR. FRANK POWNALL	

The total amount of Donations, &c., received during the past year is £30,583 16s., including £26,352 13s. 10d., the balance of the Berridge Legacy, which has been made over by the Trustees to the Institute for the purpose of establishing a Water Laboratory; Donations to the General Fund, £1,515 10s., including £105 from the Merchant Taylors' Company; £105 from the Fishmongers' Company; £525 from the Mercers' Company, and £500 from the Skinners' Company; and Donations to the Antitoxin Fund, £1,184 9s. 6d.

The work on the foundations of the New Building on the Chelsea Embankment has been carried on during the year, but owing partly to the great depth to which the contractors have had to go, and to the long frost in the winter, the progress has been slow.

In August last the Director, with the approval of the Council, commenced the preparation of Antitoxin for Diphtheria, and the demand for it soon became so great that it was found necessary to rent a farm for the purpose. "The Poplars" Farm, at Sudbury, was taken in December from Mr. T. J. Sivell, whose lease still had eleven years to run, and for which the Institute agreed to pay £800, together with an annual rent of £130. A Laboratory has been fitted up there, and Diphtheria Antitoxin is now being supplied at the rate of about 1,500 tubes every month, in addition to a certain quantity of Tetanus Antitoxin. It is anticipated that if the demand for the Diphtheria Antitoxin in its present form is maintained, the establishment at Sudbury will be self-supporting.

Dr. Bertram Hunt has, till very recently, carried on the Laboratory work at Sudbury, under the superintendence of the Director, at a salary of £150 per annum.

Dr. Richard Hewlett has been appointed Assistant in the Bacteriological Department, at a salary of £100 per annum.

JOSEPH LISTER,

Chairman.

DIRECTOR'S REPORT.

1894—1895.

It is my duty in the first place to apologise to the Council and Members of the Institute for the delay in the issuing of this Report. My excuse is that on the day that it was begun I was taken ill and incapacitated from work during four weeks.

I beg to report that, during the last year, the following work has been done at the Institute :—

A. Preparation of Curative Serum for Diphtheria.

The Members of the Council will remember that in November, 1894, I was able to report that two horses had been thoroughly immunised against diphtheria by Mr. Robertson and myself, and that their serum had very high antitoxic properties. Shortly afterwards, Dr. Bertram Hunt was appointed as special assistant in the diphtheria department, whilst the veterinary assistant, Mr. W. Robertson, M.R.C.V.S., has remained in charge of the inoculations, has carried out the necessary bleedings and has generally supervised the management of the stables and horses. It is only right to add that whatever credit may be claimed for this work, belongs almost entirely to these two gentlemen. To Mr. Robertson I am specially indebted, for, having myself no knowledge of the practical management of horses, I feel convinced that our attempts would have ended in failure had I not had his help in this special department.

I may, perhaps, be allowed to shortly indicate here the results which we have obtained, together with a few remarks on the same.

The method which we have followed for the immunisation of horses has been, with a few modifications, that recommended by Roux. The flasks of broth in which the bacillus is cultivated were generally inoculated with a bacillus recently isolated from a typical case of diphtheria. During the first few months of the work, we ventilated the flasks according to Roux's method ; that is, the air was drawn through a flask containing water and passed over the surface of the culture. In many cases five to six weeks passed before an efficient toxine was obtained. This method requires large flat flasks, which are easily broken and are difficult of manipulation ; drawbacks which, slight when few flasks are used, involve great loss of time when large quantities of toxine are required. Some flasks were made according to my instructions, so constructed that the air passes through the broth instead of over it, and, being almost round, they are easily manipulated and can be subjected to high pressures without fear of breakage. Experiment showed that a toxine, powerful enough for all practical purposes, was obtained in from 12 to 18 days, the whole process being thus greatly shortened.

The avidity with which the bacillus seizes on oxygen is strikingly illustrated by some experiments which we owe to Dr. B. Hunt. It is well known that the

bacillus of diphtheria grows best on the surface of the broth, that is, where it is in contact with the oxygen of the air. To some extent, the formation of the toxine is dependent on oxygen, for far less toxine is formed in a medium artificially freed from air. But, even in a flask exposed to air, the layer of bacilli at first present on the surface gradually falls to the bottom, where, living in a medium free from oxygen, the micro-organisms naturally produce far less toxine. If, therefore, by some mechanical means, the bacilli could be kept on the surface, in all probability the amount of toxine secreted would be greatly increased. In order to obtain this result, Dr. Hunt had the ingenious idea of covering the surface of the culture with a thin layer of powdered cork, or with little rafts made of cork surrounded by muslin. These act as mechanical supports to the bacilli, which grow luxuriantly on the surface, and Dr. Hunt found that a very strong toxine could be obtained in this manner.

Another method of demonstrating the affinity which the bacillus diphtheriæ has for air, is to cultivate it with a micro-organism either facultatively aërobic or strictly "anaërobic." Thus it had been found that the streptococcus pyogenes grows more vigorously when sown in a flask containing the bacillus diphtheriæ; but a more striking example has been demonstrated by Dr. Hunt. It is well known that the spores of the tetanus bacillus, when sown in a flask freely exposed to air, will either not grow at all or so feebly that their multiplication is hardly noticeable. On the other hand, this microbe grows luxuriantly in a medium from which the oxygen has been driven off by some inert gas, *e.g.*, hydrogen, or which has been partially or totally deprived of oxygen by the addition of chemical substances. Instead of using chemical substances, Dr. Hunt deprived the medium of oxygen by growing the bacillus diphtheriæ in it for a few days. The bacillus diphtheriæ frees the medium so thoroughly from air, that the bacillus of tetanus, when inoculated into the same flask, grows most luxuriantly; so that the paradoxical result is obtained of aërobic and a strictly anaërobic bacilli growing luxuriantly in one and the same cultivating medium. It is hardly necessary to add that such cultures were not used for the inoculation of horses.

The toxines used for inoculations were prepared from cultures sterilised by the addition of 50$^{ccs.}$ of 5 per cent. carbolic acid solution to 1 litre of culture, and then filtered through Chamberland's filter. The addition of carbolic acid increases the toxicity of the culture, probably by setting free the poisons present in the dead or living bodies of the bacilli.

The greatest care is exercised by Mr. Robertson in examining the horses previously to buying them, but being very forcibly struck with the danger of bringing fresh horses into our stables, we erected three loose boxes away from the main stables, and here every horse when bought goes through a week's quarantine. During that time the temperature is taken twice a day, and the horse is tested with mallein and tuberculin; and so thoroughly has this preliminary examination been carried out that not a single case of contagious disease has occurred. It speaks well for Mr. Robertson's management of the stables that, during last winter's epidemic, not a single horse suffered from influenza. Every horse is groomed in the morning, and is inspected at least twice a day by the veterinary surgeon, and the first horses we bought in August, 1894, are now in perfect health, and in far better condition than when they were bought, although each of them has yielded large quantities of blood.

They are perfectly good tempered, and have now been turned out to grass for reasons to be explained further on.

The inoculation is made in the shoulder, with all antiseptic precautions, and is so painless that we have never had to use forcible means of restraint. If a sufficient dose of toxine has been injected, a soft swelling forms, which, as a rule, reaches its maximum in 12 to 24 hours, and disappears entirely in 48 hours. This swelling is not tender, and the animal can walk without limping and feeds well. The temperature rises from 100 to 103°, attaining its maximum in 8 to 12 hours, but returning to normal next day. The dose is then repeated or increased, but the following table will explain on what plan the inoculations are now carried out :—

	Week 1.	Week 2.	Week 3.	Week 4.	Week 5.	Week 6.	Week 7.	Week 8.
Dose injected	Monday .25 cc.	Monday 2 cc.	Monday 10 cc.	Monday 25 cc.	Monday 50 cc.	Monday 100 cc.	Monday 100 cc.	Monday 250 cc.
Dose injected	Wednesday 1 cc	Wednesday 5 cc.	Wednesday 10 cc.	Wednesday 25 cc.	Wednesday 50 cc.	Wednesday 100 cc.	Wednesday 100 cc.	Wednesday 250 cc.
Dose injected	Friday 1 cc.	Friday 5 cc.	Friday 10 cc.	Friday 25 cc.	Friday 50 cc.	Friday 100 cc.	Friday 100 cc.	Friday 250 cc.

It need scarcely be said that this plan is hardly ever carried out in its entirety, but simply serves as a guide, for no two horses react exactly alike. Thus if a horse reacts very strongly to a dose of 25ccs. on the Monday, the injection will be omitted on the Wednesday, and possibly also on the Friday, for it is worse than useless to try and hurry matters, and it is an absolute necessity to keep all the animals in the best possible condition. In a few cases as much as 400ccs. and even 500ccs. have been injected, but such quantities are not advisable.

It is often possible then to obtain good serum in from 8 to 10 weeks without incurring any great risk, but some horses may require as long as 4 months.

When it is thought that the serum has acquired well-marked curative properties, one ounce of blood is withdrawn from the jugular vein and the serum tested in the manner presently to be described.

When the serum has strong antitoxic powers the horse is bled through a very small incision made in the shaved and aseptic skin over the jugular vein, A canula is connected with an ordinary Kitasato's flask by means of an indiarubber tubing, fitted on to a glass tube, which is passed through a tightly-fitting india-rubber stopper into the flask. The whole apparatus is carefully sterilised by heat, and the blood flows through the canula into the tube and into the bottle, without ever coming into contact with air. When the flask is full the tubing is connected with a second flask, the glass tube in the first flask being immediately plugged with sterilised cotton-wool. During the bleeding the horse is simply held by the bridle, and the eyes are bandaged to keep it quiet. The groom stands in front of the horse and places the animal's head on his own, so that it remains perfectly steady and no accidental wound of the vein occurs. Should the respiration become deeper the canula is immediately taken out, but otherwise it remains until 8 or 10 litres have been withdrawn. The canula is then removed, the vein closes automatically without any further trouble, two fine catgut stitches are placed in position and tied, the

wound dusted with iodoform and occluded with collodion, the dressing remaining *in situ* until it drops off in a few days, when everything has healed up by first intention. After a week not a trace of the operation remains. Immediately after the operation the horse is given a bucket full of warm mash, which it invariably consumes to the last drop.

The serum separates and is then poured into a large bottle, which is connected with a Berkefeldt filter, through which it is filtered into a large flask. The whole apparatus is previously sterilised by heat, and so arranged that when the serum is poured into the first flask, the filter is fed by an automatic syphon arrangement. Moreover the flask into which it is filtered can also be emptied into smaller tubes by another syphon arrangement, so that the serum does not come into contact with air until it is poured into the small flasks which are sent out to medical men. It is at this stage impossible to avoid contact with air, but the danger is minimised by the filling and corking being done as quickly as possible, and by sufficient camphor being added to each phial. In every case a test-specimen is kept, which is placed in the incubator for 48 hours to see whether it remains sterile, and should it not do so the whole would be rejected.

The strength of the serum is now tested in the following manner :—A small quantity, *i.e.*, .0002^{cc}, is carefully measured off and is mixed with twice the quantity of toxine which proves fatal to a guinea pig when injected subcutaneously. The serum should be of such a strength that this amount of it added to the quantity of toxine quoted should prevent in a guinea-pig the production of any symptoms of illness. As a matter of fact, the serum actually sent out is more then double this strength.

The immunity of the horse does not depend entirely on the so-called "antitoxic power" of its serum. It is quite true that as the animal gains the power of withstanding gradually increasing quantities of toxine, the curative properties of its serum increase also, but after a time repeated injections of enormous quantities of toxine no longer produce any reaction, and the serum does not acquire greater therapeutic properties. It would appear as if, for every animal, there was a maximum in the therapeutic power of the serum, which could not be exceeded, for if the injections are continued, the therapeutic properties of the serum actually diminish, so that at last the horse becomes more immune as the "antitoxic" properties of its serum decrease. We learnt this to our cost, as we have had to turn out five horses, the serum of which had lost to a great extent its therapeutic properties. Whether after these horses have had a long rest, the serum will regain its strength remains to be seen.

With regard to the chemistry of the toxines present in the culture, I have nothing to add except that it is clearly not necessarily due to the decomposition of proteids pre-existent in the cultures. I have been able to confirm Uschinsky's results that the diphtheria bacillus will grow luxuriantly and form proteids in a culture medium containing no proteids whatever; a result which might have been anticipated by Pasteur's experiment on the yeast-plant.

Mr. Nolan has, under my direction, investigated the chemistry of antitoxic serum. I need hardly add that this most important subject is surrounded by many difficulties. We found more than a year ago that serum is easily dried in vacuo at such a low temperature as not to affect its antitoxic power; the product is soluble in about four parts of dilute alkali. Also on precipitating the serum with ammonium sulphate it was found that the precipitate from the addition of 27 per cent. of the salt is antitoxic.

The chief difficulty in this work has been the removal of the excess of neutral salt present in the precipitate; for this purpose, three methods have been employed.

(1.) The precipitate is dried, finely powdered, and agitated with chloroform. Two layers of solids are thus obtained:—1, the upper, mainly proteid. 2, the lower, mainly ammonium sulphate.

A special apparatus was devised for the more thorough and economical carrying out of this process. By means of this apparatus, repeated and thorough "extraction" was effected without the use of much chloroform, and with little loss. It was found, however, that if the precipitate was very finely powdered, the separation of the two layers was incomplete; this method of removing the neutral salt was therefore rejected. This rejection was subsequently justified by the discovery that a solution of the proteid residue obtained in this way had lost its antitoxic power.

(2.) The second method employed consisted in subjecting the re-dissolved precipitate to prolonged dialysis in running water, with aseptic precautions. The subsequent examination of the dialysate showed that the bulk of the salts were removed, that the aseptic precautions had been successful, and that the antitoxic power was retained. The dialysate was turbid, and the turbity was not removed by paper filtration, but was easily removed by the addition of a small quantity of alkali or neutral salt.

(3.) The third method employed is based upon the double decomposition between baryta and ammonium sulphate. Finely powdered baryta is carefully and thoroughly incorporated with the moist precipitate, and the mixture is evaporated in vacuo over sulphuric acid. The resulting extract is found to be practically free from ammonium sulphate. There are two modifications of this process: (1), an excess of Baryta is added, and the small quantity present in the extract is subsequently removed by precipitation with sodium sulphate; (2), a bare excess of ammonium sulphate is allowed. The object is, of course, the avoidance of the extremely poisonous Barium compound in the final extract. The former modification effects this in the most satisfactory manner. The product so obtained fully retains the antitoxic properties in a very concentrated form.

Dr. Hewlett and Mr. Nolan have examined several hundred specimens sent for diagnosis to the Institute.

21,000 doses of curative serum for diphtheria have been sent out by the Institute, and 250 grammes of dried antitoxic serum for tetanus. In spite of the demand, the Institute is not making a profit, as the price of a dose of curative serum is

only 5d., 3 doses being sent in each bottle. The demand has steadily increased, and as many as 1,500 doses have been provided in one week. The results obtained will be fully discussed at the coming meeting of the British Medical Association.

B. Immunisation of Horses against the Diphtheria Bacillus and Streptococcus Pyogenes.

The majority of clinical observers have laid stress on the fact that in septic cases of diphtheria death was due, not only to the action of the diphtheria bacillus, but to a great extent to secondary invasion by the Streptococcus pyogenes. On the other hand, in smaller animals it has been found possible to obtain by repeated injections of the s. pyogenes a curative serum against this organism. Struck by these facts, Mr. Robertson and I determined to endeavour to obtain serum which would be efficient against both the diphtheria bacillus and the Streptococcus pyogenes. A great many unexpected difficulties arose, but we have now, at Sudbury, horses thoroughly immune against both organisms, and possessing high therapeutical properties. By September next the serum may be used for patients suffering from severe cases of septic diphtheria or angina due to the Streptococcus pyogenes.

C. Immunisation of Horses against the Streptococcus Pyogenes and Streptococcus Erysipelatis.

Concurrently with the last series of experiments, Mr. Robertson and I immunised one horse against the Streptococcus pyogenes alone, and the Streptococcus erysipelatis in order to obtain the therapeutic serum for the use of the patients suffering from the diseases caused by these two organisms. I hope that by the next meeting of the Council, I shall be able to publish the results in full.

D. Immunisation of Horses Against Tetanus.

The Institute already possesses one horse immunised by Dr. Hewlett against tetanus. I thought it my duty, however, to see that another horse was immunised in case anything happened to the first animal. This has now been satisfactorily accomplished by Dr. Hewlett and Mr. Robertson.

E Preparation of Dr. Coley's Fluid and Dr. Richet's Anti-cancerous Serum.

At the request of the Chairman, I have prepared both these substances for the use of practitioners. I offer no opinion as to their possible value, but with so dread a disease as cancer, it is only right that practitioners should have every chance of trying new remedies which are said to offer some hope.

F. Other Investigations.

With the assistance of Mr. Robertson, I have endeavoured to see whether by methods similar to those used in diphtheria, it would be possible to obtain a cure for typhoid, tubercle, and the diseases produced by the staphylococcus aureus. The results so far do not allow us to draw any safe conclusions.

Dr. Plimmer has continued his investigations on cancer.

Dr. Dünschmann, Assistant in the Surgical Clinic in Berlin, concluded his investigations on the giant cells of cancer. His work has been published in the JOURNAL OF PATHOLOGY AND BACTERIOLOGY for November, 1894.

G. Mr. H. Nolan has assisted me in various ways, but I must draw attention to his work on *the Electrolysis of sea-water.*

The Council will remember that whilst investigating the Hermite system at Worthing, Mr. Lunt, of this Institute, found that a solution produced by the electrolysis of sea-water and containing 0·5 per cent. available chlorine, had marked antiseptic powers, but that for practical purposes it was useless, as it was so unstable that it lost 90 per cent. of its available chlorine in 24 hours. Mr. Nolan's object in continuing this work was to see whether or not it was possible to obtain a solution containing at most 0·5 per cent. of available chlorine and which should be comparatively stable.

Mr. Nolan has found that if a porous partition was interposed between the anode and the kathode, so as to interfere with the circulation of fluid between the two electrodes without interfering with the process of electrolysis, a fluid was obtained which satisfied the above requirements.

The fluid is acid in reaction. In this way a stable and antiseptic fluid may be obtained at a very cheap rate.

The process is now the subject of a provisional specification.

H. MR. LUNT REPORTS AS FOLLOWS:—

As requested by Dr. Ruffer, I beg to report on the progress of work which has been done in the Water Laboratory since my appointment.

That portion of the Investigation of the Hermite Process which was under my charge has been published before the Society of Chemical Industry in a paper read before that Society on March 4th last.

A reprint of the paper has been forwarded to every Member of the Council and others.

The public has been invited to forward samples of water to the Institute for Chemical and Bateriological examination. The Laboratory is ready, and is now fitted for the reception of such work.

A complete set of accurately standardised solutions has been prepared, and every sample of water which is received will, in future, be examined by special methods, not only for the number of micro-organisms it may contain, but also for sewage contamination, and especially for the Bacillus Coli Communis and the Typhoid Bacillus.

So far, the number of samples of water coming in from the outside public is very few. Only ten samples have been received, and four of these were from Sir Henry Roscoe. Of the rest, one was from the official residences of the House of Commons, one from the old well at Eton College, and four others from Milford-on-Sea, Braintree, Bonchurch, and Haywards Heath respectively. In one case the sample of water was sent by a medical man, with a special request that it be examined for the presence or absence of the Typhoid Bacillus. This water was certified a good one, and the Typhoid Bacillus was proved absent. In my opinion the existence of the Water Laboratory should be further advertised.

The whole question of the detection of sewage contamination of water, from a Bacteriological standpoint, is in urgent need of investigation, and I have laid certain proposals before Sir Henry Roscoe in order that he may bring the same before the Council with a view to their granting me further assistance in carrying out the work, and I am now only waiting for such further assistance to begin this important investigation.

It is very desirable, if the Water Laboratory is to do work at all comparable to that done by other workers in the same field [*e.g.* Profs. Frankland and Marshall Ward], that I should no longer work single-handed, but that a properly qualified assistant should be appointed to work under my directions. By this means important and urgent work could be accomplished, which it is impossible for me to carry out without further assistance.

Other chemical work has been received, viz. :—

(1). A sample of preserved egg for analysis and report.

(2). A calcareous and phosphatic deposit taken from the vermiform appendix of a patient whose death it was supposed to have caused.

I have also been occupied with some experiments for Dr. Ruffer on the possibility of producing a powdered dry antitoxin by evaporation in vacuo, without the use of hygroscopic substances. From these experiments no useful result was obtained, and Dr. Ruffer transferred them to his own department.

The second paper, entitled "Contributions to the Chemical Bacteriology of Sewage" is now being written and will shortly be presented to the Royal Society for publication in their "Transactions."

Dr. Macfadyen and I are at present engaged in perfecting improvements in Aitken's Dust Counter, in order that it may be available for an investigation on "The relation between dust and micro-organisms in air," referred to in one of my previous reports to the Council. It is hoped that this apparatus may ultimately prove of practical value in Hygienic investigations with reference to air.

I am at present engaged on an investigation of the Berkefeld Filter, at the request of the Berkefeld Filter Company.

The special points upon which the Company desires an investigation and report are :

(1). Will it (the filter) permit the passage of pathogenic bacteria when suspended in water without a nutrient fluid ?

(2). For what length of time will it continue to remove pathogenic bacteria under the same conditions ?

(3). Will pathogenic bacteria grow through the filter when not supplied with any artificial nutriment.

(4). If sterilised daily, can the Berkefeld Filter be relied upon to yield a supply of sterilised water for use in aseptic surgery.

(5). Are pathogenic germs which are suspended in water which is contaminated with sewage matter, but which seems still fit for drinking purposes, absolutely and permanently interrupted by the Berkefeld Filter.

These points are now under investigation. I may mention that Shaefer has made experiments which indicate that the pathogenic organisms of typhoid and cholera do not pass through the filter unless broth or other nutritive material is introduced along with the organisms. So far as the experiments have gone at present, they show that the sterilised filter will remove all the bacteria from a broth cultivation swarming with the organisms. It will also remove all the bacteria from water which has been rendered turbid by the artificial introduction of bacteria without any nutriment medium accompanying them.

If, however, the bacterial mud be allowed to remain outside the filter for two days in the incubator, then the organisms pass through the filter in small numbers.

If a sterilised filter be used for the filtration of London tap-water, a perfectly sterile filtrate is obtained on the first day after the commencement of its use, but on the second day the filtrate is no longer sterile, absolutely, as water bacteria have in that period grown through the pores of the filter.

The experiments on the Iris disease which I am carrying out at the request of the Curator of Kew Gardens, and which have been interrupted during the winter months owing to the unsuitable weather, have been resumed.

The disease has reappeared, and the organism which was suspected of being the cause of the disease has been re-isolated, and further experiments are in progress with the plants at Kew.

DR. FRANK R. BLAXALL HAS DONE THE FOLLOWING WORK—

1st. AN INVESTIGATION OF THE THERMOPHILIC BACTERIA.

This was carried out with Dr. Macfadyen, *vide* JOURNAL OF PATHOLOGY, 1894.

2nd. An investigation as to the possible antiseptic action of *Saccharine* on micro-organisms.

The organisms used were :—

B. Anthracis (sporing); B. Subtilis (sporing); B. Pyocyaneus; B. Prodigiosus; Mould, Penicillium Glaucum ; Yeast, Saccharomyces Glutinus.

Two specimens of Saccharine were forwarded for investigation, an *ortho*-compound and a *para*-compound.

The results were :—

1st. That experiments on the micro-organisms above enumerated displayed no difference between these two compounds.

2nd. That Saccharine has no *true disinfectant* action.

3rd. Saccharine in high percentages has an antiseptic action, that is, its continued action, as in solution in cultural media, retards the development of micro-organisms, but in no case does it absolutely check their growth.

4th. That to exert any appreciable effect on micro-organisms, Saccharine must be present practically up to $\frac{1}{2}$ per cent.

5th. Moulds are less susceptible to its action than are Bacteria.

3rd. An investigation, undertaken for Dr. Bannatyne, of Bath, regarding micro-organisms found in certain cases of Rheumatoid Arthritis.

This investigation was commenced in October, 1894. The work, at any rate in its preliminary stages, is nearly complete, and I hope in a short period to be able to submit a full report.

4th. In November an investigation as to the question of producing immunity from Pneumonia was commenced.

Pure cultures of the Pneumococcus were first obtained, and experiments were performed to procure virulent toxines from the micro-organisms by artificial cultivation. Different media have been tried and under varying circumstances, as for instance, ventilation, but up to the present unsuccessfully.

By inoculating from animal to animal, however, attenuating the organisms by heat, I have induced immunity in rabbits ; and experiments are now in progress

to see if immunity can be conferred on animals by means of the serum of animals thus rendered immune.

5th. A further investigation on the Thermophilic Bacteria has been commenced with Dr. Macfadyen, in whose report particulars are stated.

DR. ALLAN MACFADYEN'S DEPARTMENT.

Dr. Allan Macfadyen submits the following report of the work carried on in his Department under his superintendence during the past year.

It was found that the increasing work of the department rendered the services of an assistant necessary.

Dr. Macfadyen is indebted to the Council of the Institute for granting him an assistant. Dr. R. T. Hewlett was appointed Assistant Bacteriologist, and entered on the duties of the post on December 1st, 1894. It is a great pleasure to acknowledge the valuable nature of the services he is rendering to the department.

The work that is being carried on falls under three heads—Research, Investigation, and Teaching.

I. RESEARCH.

The results of a research upon Thermophilic bacteria by Drs. Macfadyen and Blaxall have been published in the JOURNAL OF PATHOLOGY AND BACTERIOLOGY. It was found that these organisms are widely distributed in nature, and that the bacteria capable of growing at very high temperatures (60—65° C.) form a large and important group. The investigation of these organisms is being continued at present, with special reference to their fermentative activity and the chemical bodies they give rise to. A silo has been laid down at Sudbury, with a view of testing the share such bacteria may take in fermentations characterised by the production of considerable heat, *e.g.*, ensilage, manure fermentations, &c.

Cellulose appears to be attacked by the Thermophilic bacteria, and special attention is being devoted to the point. Our knowledge of the causes at work in the redistribution of cellulose is imperfect. The "pure fermentations" of cellulose have been but little studied, and require investigation.

Drs. Macfadyen and Blaxall are making a special study of this subject, which has an important bearing on the physiology of plants and animals. They are much indebted to Messrs. Cross and Bevan for assistance and advice, and for furnishing them with specially prepared, chemically pure samples of the various types of cellulose.

A paper by Dr. Macfadyen upon the ferments produced by the Ringworm organism has been published in the JOURNAL OF PATHOLOGY AND BACTERIOLOGY. It was found that the Tricophyton could be grown on a purely Keratin soil.

Mention was made in last year's report of an inquiry with regard to the ice creams vended on the streets of London. During the year a large number

of samples have been examined, with the assistance of Mr. J. R. Colwell, F.I.C. The results are in the Press. It is proposed to issue them in pamphlet form, and to send copies to the various district Medical Officers of Health, as the filthy state of these commodities undoubtedly forms a danger to a large class of the community.

Drs. Macfadyen and Hewlett are continuing their work upon the Bacillus of Symptomatic Anthrax. They are investigating the nature of the toxins produced by this organism, as well as making immunising experiments. The results will form the subject of a paper.

Some little investigated points connected with the Diphtheria and Tetanus toxins are also engaging their attention. They are preparing Mallein and Tuberculin. It is hoped that by preparing the Mallein according to Foth's method a more stable and efficacious re-agent will be obtained.

Dr. Hewlett is continuing the preparation of the Tetanus toxin for injection, as well as his work on Tetanus and Tetanus antitoxin.

Dr. Hewlett, with the aid of a grant from the British Medical Association, is also advancing his work on the chemistry of malignant tumours, and has just furnished a report to the Grant Committee on a portion of this subject The subject has been but little investigated. Dr. Hewlett has also carried out some experiments on Ehrlich's diagnostic test for Typhoid Fever. The results will be communicated to the British Medical Association Meeting.

Dr. Walters is carrying out some experiments on the dosage of Guaiacol and Creasote for hypodermic injection in the treatment of tubercular diseases, and on the use of other agents in like conditions.

The experiments are not yet sufficiently advanced to admit of a report being made.

Dr. A. G. Foulerton has concluded the experiments he has been making on the action of the Pancreatic enzymes on blood pigments. In certain cases of traumatic pancreatic cysts, a dark green pigment is produced by the action of the pancreatic secretion on the extravasated blood. A series of experiments show that the action of the pancreatic enzymes on hæmoglobin under varied conditions results invariably in the formation of alkali hæmatin. But the experiments also show that it is impossible by any degree of concentration or dilution to reproduce the green colour of the cyst with Hæmatin in an alkaline solution.

In one case observed, the colour of the fluid was exactly that of a fairly concentrated solution of Biliverdin. The pigment also resembled Biliverdin, in that it was insoluble in water and readily soluble in alcohol. Whilst the primary action of the pancreatic enzymes is to break up hæmoglobin into hæmatin and globulin, it is probable that under vital conditions the continued action of the ferment produces a further change in the hæmatin, with the result that Biliverdin is formed. Langhans found that on injecting blood subcutaneously, the blood pigment disappeared, and Bilirubin and Biliverdin were formed. In the experiments that have been made outside the body with the Pancreatic Enzymes, the change did not, however, proceed beyond the alkali hæmatin stage. The subject will be treated in more detail when the results are published. The new spectroscope acquired by the Institute proved of great value in these experiments.

Dr. Foulerton is now engaged in a research upon the Gonococcus. The methods for cultivating the Gonococcus outside the body recommended by Finger, Turro, Wertheim, Kral, and others, are being tested. All these methods fail at times, and the endeavour is being made to devise some suitable medium for its cultivation, which might be clinically of some value.

Dr. S. Russell Wells is carrying out a research with regard to the bactericidal bodies contained in the organs of animals. The work is being advanced satisfactorily, and the results will be communicated when the final stage is reached.

Dr. Sinclair Thomson, with the assistance of Dr. Hewlett, is investigating the bacterial flora of the air passages, in continuation of the work recently communicated to the Medical Chirurgical Society. The interesting point was proved that the nasal cavity proper is practically free from bacteria. The fate of micro-organisms in the nose is now being investigated. There has hitherto been very little work done on the bacteriology of the normal nasal cavity.

Mr. Barnard is still engaged in an investigation upon Phosphorescent bacteria, with reference to the nature of the phosphorescence and the conditions most favorable to its production. The subject is so complicated that progress is necessarily slow.

Dr. Renner has worked at the bacteriology of the Vaccine lymph, prepared in his establishment.

Dr. Clemow has been testing the relative value of certain Disinfectants, following the methods recommended by Dr. Abbott. The action of Izal, Lysol and Jeyes' fluid was tested on pus organisms, the Diphtheria and Anthrax bacillus. Izal was found to be the most energetic disinfectant of the three.

Experiments are being carried out with the Dust Counter and Koniscope, instruments, devised by Dr. Aitken, F.R.S., and used by him in his well-known researches. Dr. Macfadyen and Mr. Lunt have found that the "Pocket Dust Counter" cannot be used in the dust-laden air of London. They have, therefore, modified it in some details, and a model is at present being constructed.

Dr. Aitken has kindly offered his advice and help in the matter. If the experiments prove successful, the Dust Counter and Koniscope will be of great practical value, from a hygienic point of view, in determining the purity of the air in towns and dwellings.

A communication will be made to the British Medical Association of the observations made by Dr. Macfadyen and others as to the production of methyl. mercaptan by bacteria, and its occurrence in the body.

LABORATORY WORK UNDERTAKEN FOR PUBLIC BODIES AND OTHER INDIVIDUALS.

Drs. Macfadyen and Hewlett have investigated cases of suspected rabies in dogs, for the Derbyshire County Council. The diagnosis of rabies was established in each case. A case of supposed Anthrax in man was also examined, and, at the request of Dr. Thin, cases of a disease of obscure etiology—Psilosis or Sprue.

An apparatus for preventing impure fermentations of cider was tested—a matter of importance for cider manufacturers.

Dr. Hewlett has made the bacteriological examination in a number of suspected cases of Diphtheria.

A new antiseptic, for external use, called Nosophen (Tetraiodide phenolphthalein) is being tested in its action on pathogenic bacteria, especially pus organisms. It has the advantage over Iodoform of absence of smell and poisonous properties, and is further soluble in alkalis and in blood. If found active, it should prove useful in surgical practice.

III. TEACHING.

It may be mentioned here that during the year 1894 there were 25 students and workers in the department. The present year shows a marked increase, as during the first six months there have been 31 students and workers. The increase in the number of research workers is a gratifying feature.

The practical instruction is intended for senior students, and comprises two branches, viz., Bacteriology in relation to Medicine and Pathology, and Bacteriology in relation to Public Health.

Arrangements have just been completed for instruction in Bacteriological Chemistry, and two students have already entered. The course given is based on the physiological chemical methods employed in the laboratories of Professor Nencki and Professor Salkowski.

An evening class in Bacteriology, held at the beginning of the year, was attended by eight medical men and three chemists. The class was found useful by physicians in fever hospitals, and others who had no time for such work during the day.

Arrangements have been made for instruction in the bacteriology and chemistry of Fermentation. The instruction given will be specially adapted for chemists, agriculturists and those interested in dairy farming. Dr. Macfadyen is indebted to Prof. Hansen, of Copenhagen, who has presented the Laboratory with a set of his typical yeast cultures. A short course in this subject will be given in July.

The Department now possesses a photomicrographic apparatus, and Mr. Barnard is in charge of the photomicrography.

Mr. Barnard gives instruction to those workers in the Laboratories who may wish to learn how to do their own photographic work. The photographs in connection with any research requiring such illustration will also be made by him He is also preparing a series of photographs of typical cultures of bacteria. These will be exhibited at the meeting of the British Medical Association.

The work referred to in this report is at present being carried out in three small and ill-ventilated rooms at the top of the premises in Great Russell Street, Dr. Macfadyen hopes that he may be granted the full use of an additional room, where the chemical work could be carried out with greater convenience and comfor to all concerned.

101, Gt. Russell Street,

London, W.C.

TREASURER'S REPORT.

I beg to report that during the year ending 31st May last the following Donations, &c., have been received by the Institute, viz. :—

Grant from the Berridge Trustees for the purpose of building and endowing a Laboratory specially devoted to the Chemical and Bacteriological Examination of Water and Sewage	£26,352	13	10
Donations to the General Fund	1,515	10	0
Donations to the Antitoxin Fund	1,184	9	6
Annual Subscriptions	15	10	0
Interest on Investments	1,514	3	6
Profit on Sale of Investments	249	12	11
Rent of Room to Mr. Colwell	35	0	0
Students' and Laboratory Fees	174	6	0
Diagnosis Fees	38	6	0
Sales of Antitoxins	504	4	3
Total	£30,583	16	0

The total expenditure for the year at Gt. Russell Street, charged to Income and Expenditure Account, is £2,461 17s., including £30 written off Lease Account, and £219 12s. 9d. for depreciation of Furniture, Fittings and Apparatus.

At the "Poplars" Farm the Expenditure since November has been £2,915 13s., of which £1,336 14s. is charged to Capital Account as representing the unexpired term of the Lease, Apparatus, Furniture and Fittings.

The Expenditure on the New Building on the Chelsea Embankment has been £5,931 15s. 6d., making a total Expenditure for the year of £11,309 5s. 6d. Of this amount £2,045 14s. 11d. was still owing on June 1st, and included the following items :—

For Foundations, &c., of New Building	£1,542	5	0
For Law Charges (estimated)	200	0	0
For various other small accounts for Animals, Forage, Laboratory Apparatus and Expenses, Salaries, Wages, &c.	303	9	11
	£2,045	14	11

The Accounts have been audited by Messrs. Cooper Brothers & Co., Chartered Accountants, and the Balance Sheet and Statements of Accounts as passed by them are as follows :—

BALANCE SHEET,

May 31st, 1895.

The British Institut

(With which is amalgam

Registered 25th July, 1891, under the Companies A

Dr. BALANCE SHEE

	£ s. d.	£ s. d.
To Creditors		2,045 14 11
To Water Laboratory Fund—		
Amount received from the Trustees of the late Richard Berridge, for building and endowing a Water Laboratory, conditionally that not more than £8,000 shall be spent upon the building		26,352 13 10
To Capital Fund—		
Balance as per last account, 31st May, 1894	46,194 5 11	
Add.		
Balance of Income and Expenditure account for the year ending 31st May, 1895 ... £1,080 11 5		
Balance of Sudbury Farm Account ... 109 14 9		
	1,190 6 2	
		47,384 12 1

HENRY E. ROSCOE,
HON. TREASURER.

£75,783 0 10

We have examined the above Balance Sheet with the Books and Vouchers of the Institute, ar
State of the Affairs of the Institute. We have also verified the Bankers' Balances and the Investments

London, 26th June, 1895.

Preventive Medicine.

(College of State Medicine.)

to 1890, as an Association, Limited by Guarantee.

st May, 1895. Cr.

	£ s. d.	£ s. d.
By Cash—		
At Bankers	889 9 4	
In Hand	26 5 0	
		915 14 4
By Investments—		
£24,528 9 3 2¾ per cent. Consols	24,578 14 2	
£1,500 City of Sydney 4 per cent. Bonds	1,500 0 0	
£2,900 New South Wales 3½ per cent., Stock 1918	2,897 16 0	
£1,000 Cape of Good Hope, 3½ per cent. Stock	1,000 0 0	
£3,800 North Eastern Railway, West Hartlepool, 4 per cent. Preference Stock	5,377 12 0	
£1,300 Great Western Railway, 5 per cent. Rent Charge Stock	2,276 5 10	
£2,200 South Eastern Railway, 5 per cent. Perpetual Debenture Stock	3,962 8 6	
Mortgage on Freehold Property, Liscombe Estate, at 3½ per cent.	18,500 0 0	
		60,092 16 6
By Sundry Debtors		160 6 10
By Furniture, Fittings, and Scientific Apparatus, as per last Account, 31st May, 1894	881 18 0	
Add Additions during the year	216 5 9	
	1,098 3 9	
Less Written off for Depreciation	219 12 9	
		878 11 0
By Unexpired Term of Lease of 101, Great Russell Street, as per last Account, 31st May, 1894	75 0 0	
Less Proportion charged to Income and Expenditure Account ...	30 0 0	
		45 0 0
By Expenditure on New Building—		
As per last Account, 31st May, 1894	6,422 2 6	
Expenditure during the year on Foundations	5,931 15 8	
		12,353 18 2
By Sudbury Farm Account—		
Stock of Animals, at estimated value	170 14 0	
Stable Utensils, at estimated value	56 7 2	
Laboratory Apparatus, at cost	201 9 0	
Furniture, at estimated value	81 10 6	
New Buildings...	56 13 4	
Unexpired Term of Lease of "The Poplars" Farm	770 0 0	
		1,336 14 0
		£75,783 0 10

t is a full and fair Balance Sheet, properly drawn up, so as to exhibit a true and correct view of the

COOPER BROTHERS & CO.,
Chartered Accountants. } *Auditors.*

The British Institute

(With which is amalgamated

Dr. INCOME AND EXPENDITURE ACCOU

INCOME.

	£	s.	d.
To Donations to General Fund	1,515	10	0
To Annual Subscriptions	15	10	0
To Interest on Investments	1,514	3	6
To Profit on Sale of Investments	249	12	11
To Rent	35	0	0
To Students and Laboratory Fees	174	6	0
To Diagnosis Fees	38	6	0
	£3,542	8	5

Dr. SUDBURY FARM INCOME AND EXPENDITU

INCOME.

	£	s.	d.
To Donations to Anti-Toxin Fund	1,184	9	6
To Sale of Anti-Toxins	504	4	3
	£1,688	13	

reventive Medicine.

LLEGE OF STATE MEDICINE).

the Year Ending 31st May, 1895. Cr.

EXPENDITURE.

	£	s.	d.
By Rent, Rates, and Taxes	134	15	10
By Salaries, Wages, and Fees to Scientific Staff	1,181	18	1
By Stationery, Printing, Postage, and Advertising	149	17	7
By Office Expenses and Sundries	44	19	0
By Bank Charges	2	7	1
By Law Charges (estimated)	200	0	0
By Travelling Expenses	94	17	5
By Auditors' Fee	15	15	0
By Gas and Water	59	1	2
By Proportion written off Unexpired Term of Lease of 101, Great Russell Street ...	30	0	0
By Bristol Exhibition Expenses	11	8	6
By Bacteriological Laboratory Expenses	52	2	1
By Water Laboratory Expenses	37	7	0
By Research Laboratory Expenses	212	16	9
By Repairs of Premises	14	18	9
By Amount written off for Depreciation on Furniture, Fittings, and Scientific Apparatus	219	12	9
	£2,461	17	0
By Balance being Excess of Income over Expenditure transferred to Capital Fund, *see* Balance Sheet	1,080	11	5
	£3,542	8	5

COUNT from 1st November 1894, to 31st May, 1895. Cr.

EXPENDITURE.

	£	s.	d.	£	s.	d.
By Rent, Rates, and Taxes	95	0	6			
By Salaries and Wages	328	4	0			
By Animals	247	3	6			
By Forage	330	9	3			
By Cartage	8	13	0			
By Stable and other Expenses	62	16	10			
By Farm Expenses	20	3	6			
By Gas and Water	27	1	2			
By Purchase of Lease of "The Poplars" Farm for 11 years, from 25th December, 1894	800	0	0			
By Repairs and Alterations	432	18	3			
By Furniture	90	11	8			
By Laboratory Apparatus	201	9	0			
By Laboratory Expenses	204	16	3			
By Stable Utensils	66	6	1			
				2,915	13	0
Deduct.						
Transferred to Balance Sheet.						
Stock of Animals, at estimated value	170	14	0			
Stable Utensils, at estimated value	56	7	2			
Laboratory Apparatus, at cost	201	9	0			
Furniture, at estimated value	81	10	6			
New Buildings	56	13	4			
Unexpired Term of Lease of "The Poplars" Farm	770	0	0			
				1,336	14	0
See Balance Sheet						
				1,578	19	0
By Balance transferred to Capital Fund, *see* Balance Sheet ...				109	14	9
				£1,688	13	9

British Institute of Preventive Medicine.

(With which is amalgamated the College of State Medicine.)

ANNUAL REPORT

AND

BALANCE SHEET.

June, 1895.